Topic X3 Calculus (Pre-TT C) [40]
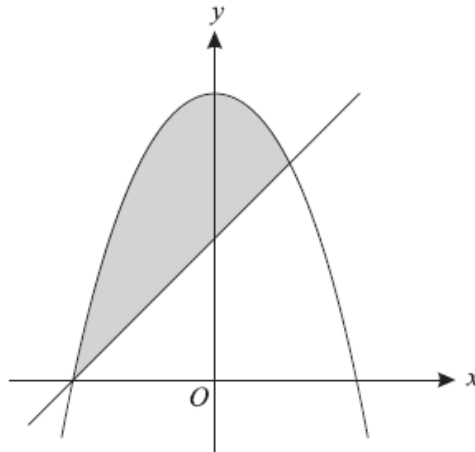
1.

(i) Find $\int (2x+1)(x+3)\,dx$. [4]

(ii) Evaluate $\int_0^9 \frac{1}{\sqrt{x}}\,dx$. [3]

(Total 8 marks)

2.

The diagram shows the curve $y = 4 - x^2$ and the line $y = x + 2$.

(i) Find the x-coordinates of the points of intersection of the curve and the line. [2]

(ii) Use integration to find the area of the shaded region bounded by the line and the curve. [6]

(Total 8 marks)

3.

(i) Sketch the curve $y = 2x^2 - x - 6$, giving the coordinates of all points of intersection with the axes. [5]

(ii) Find the set of values of x for which $2x^2 - x - 6$ is a decreasing function. [3]

(iii) The line $y = 4$ meets the curve $y = 2x^2 - x - 6$ at the points P and Q. Calculate the distance PQ. [4]

(Total 12 marks)

4.

The cubic polynomial $2x^3 + kx^2 - x + 6$ is denoted by $f(x)$. It is given that $(x + 1)$ is a factor of $f(x)$.

(i) Show that $k = -5$, and factorise $f(x)$ completely. [6]

(ii) Find $\int_{-1}^2 f(x)\,dx$. [4]

(iii) Explain with the aid of a sketch why the answer to part (ii) does not give the area of the region between the curve $y = f(x)$ and the x-axis for $-1 \leqslant x \leqslant 2$. [2]

(Total 12 marks)